

**PROSECUTION STAFF REPORT  
CONSIDERATION OF CEASE AND DESIST ORDER  
  
FOR  
CITY OF DIXON  
WASTEWATER TREATMENT FACILITY  
SOLANO COUNTY**

**Introduction**

The City of Dixon owns and operates a wastewater treatment facility (WWTF) located in farmland to the southeast of the City of Dixon. The WWTF is regulated by Waste Discharge Requirements (WDRs) Order No. 94-187, as well as by Cease and Desist Order (CDO) No. R5-2005-0078. The facility serves the City of Dixon, with a population of approximately 17,600, and consists of a headworks and approximately 420 acres of unlined wastewater treatment/storage ponds, percolation/evaporation ponds, and land application disposal areas. The City relies exclusively on percolation and evaporation to dispose of wastewater. The WDRs authorize a monthly average dry weather flow of 1.2 million gallons per day (mgd), while CDO No. R5-2005-0078 authorizes a flow of 1.82 mgd. Current influent flows to the treatment facility are approximately 1.3 million mgd.

At a permitted flow of 1.82 mgd, the City of Dixon is one of the largest facilities in the area that discharges its wastewater only to land. The pond system provides for approximately 65% organic removal, well below the 80-90% organic removal expected by other treatment processes. The wastewater is not disinfected or denitrified before application to land. Most facilities the size of Dixon have more advanced treatment processes, and generally discharge to surface waters under an NPDES permit. Comparably sized facilities, such as the City of Auburn's wastewater treatment plant with a design average dry weather flow of 1.67 mgd, also typically provide a significantly higher level of treatment and control, which allows more options for disposal. Many smaller facilities, especially those regulated under the NPDES program, also provide greater treatment of their waste stream than does the City of Dixon.

Based on data provided through the State Water Resources Control Board's 2007-2008 wastewater annual sewer rate survey, the City's currently monthly sewer use rate of \$15.65 per month falls well below the average rate of \$29.27 for facilities with treatment capacities of 1.0 to 2.5 mgd.

The proposed Cease and Desist Order (CDO) primarily addresses impacts to groundwater salinity at the City's WWTF. This staff report discusses previous formal enforcement actions against the City, the City's request for a new CDO, effluent and groundwater quality data for the WWTF, the basis for limitations and reporting requirements, the significance of water softeners for this site, and outstanding issues. The outstanding issues pertain to the nature of the City's water quality impact as compared to the impact of surrounding land use and the role of groundwater monitoring in assessing compliance. This staff report concludes with a summary and staff's recommendation.

## **Previous Enforcement**

Findings No. 5 through 20 of the proposed Cease and Desist Order provide details about the history of violations at this facility. To summarize, the most recent WDRs were adopted in June 1994, and since that time, the Regional Water Board has adopted three Cease and Desist Orders for the City's facility, primarily due to excessive inflow and infiltration (I/I); inadequate treatment, storage, and disposal capacity; and degradation and/or pollution of groundwater. The City has not fully complied with any of the enforcement orders. The issues surrounding the most recent CDO are discussed below.

### 2005 Cease and Desist Order

On 24 June 2005, the Regional Water Board rescinded CDO No. 97-193 and adopted CDO No. R5-2005-0078, which requires that the City to expand the facility as needed to provide adequate treatment, storage and disposal capacity through 2014 and construct various improvements needed to ensure compliance with the groundwater limitations of the WDRs. The 2005 CDO was uncontested.

The City has submitted the required progress reports, complied with the influent flow limits, and has satisfactorily completed and submitted certain required technical reports. Other requirements contained in the CDO were not satisfied. The City failed to submit, or submitted deficient, technical reports on proposed facility improvements, financing, and hydrogeological investigations, and failed to complete associated compliance tasks. In addition, the City failed to submit the required Report of Waste Discharge.

In July 2006, the Dixon City Council increased monthly sewer rates to \$24.90 to support repayment of general obligation bonds that it planned to issue to finance the projects required by the 2005 CDO. However, a citizens group placed an initiative on the Dixon ballot in order to halt sewer rate increases. This measure passed in November 2006 and the sewer use rates returned to \$15.65 per month. The Dixon City Council then formed the Citizens Wastewater Advisory Committee, and the Executive Officer and Regional Water Board staff were asked to attend a series of workshops regarding wastewater issues. On 11 July 2007, the City met with the Executive Officer and requested a new CDO as it could no longer meet the timeframes in the current CDO. The Executive Officer asked that the City make its request in writing, and to describe specific items and timeframes that it proposed to address the groundwater issues.

### 2008 Administrative Civil Liability Complaint

On 25 January 2008, the Executive Officer issued a \$220,000 Administrative Civil Liability Complaint for failure to comply with CDO No. R5-2005-0078. At the City's request, a one-week extension of the 25 February 2008 deadline for responding to the Complaint was granted. The City submitted a signed hearing waiver and a check for \$220,000 dated 29 February 2008. No public comments were received during the comment period or the one week extension. Resolution of the Complaint is complete and is not a subject of discussion at this hearing.

## Proposed New Cease and Desist Order

In a letter dated 20 November 2007, the City requested a new CDO with the following:

- Establishment of interim effluent limitations based on protective groundwater limitations;
- Review of additional groundwater quality data to establish protective groundwater limitations at a later date;
- A four-year schedule to achieve compliance with interim effluent limitations; and
- Allowing the City to evaluate of compliance status and additional measures needed after four years.

A draft CDO was made available to the City on 4 February 2008. A tentative CDO, unchanged from the draft version, was made available for public comment on 11 February 2008.

Comments on the tentative CDO were received from the City of Dixon (Discharger) and Michael Ceremello (Dixon resident). Attachment A contains responses to the comments submitted.

In response to the comments, staff and the City engaged in a series of meetings between May and August 2008 to discuss the site hydrogeologic model as it pertains to the requirements of the tentative CDO. Staff's conclusion is that the site is geologically complex, and the existing data can be interpreted several ways. Attachment B to this staff report contains Regional Water Board staff's review and interpretation of the groundwater analytical data and other sub-surface data submitted by the City.

## Wastewater Effluent Quality and Water Softeners

The City of Dixon obtains its domestic water supply from several deep wells drilled throughout the City. The water supply has a low salinity (electrical conductivity around 600  $\mu\text{mhos/cm}$ , sodium around 50 mg/L, and chloride around 13 mg/L), but is considered hard to very hard, with an average hardness of about 250 mg/L. It is expected that salinity in wastewater will be greater than in the supply water, through normal domestic usage. However, as shown in the table below, the additional salinity concentration in the City's wastewater substantially exceeds the usual increase, especially for sodium and chloride.

	<u>EC</u>	<u>Sodium</u>	<u>Chloride</u>
Typical increase in domestic sewage <sup>1</sup>	+500 $\mu\text{mhos/cm}$	+20-50 mg/L	+40-70 mg/L
Dixon's increase <sup>2</sup>	+700 $\mu\text{mhos/cm}$	+160 mg/L	+130 mg/L

<sup>1</sup> Tchobanoglous, George, Burton, Franklin L., and Stensel, H. David (2003). Wastewater Engineering: Treatment and Reuse (4th edition, Metcalf & Eddy, Inc.). McGraw-Hill.

<sup>2</sup> Based on City of Dixon's discharger self-monitoring reports for April 2004 through June 2008 and flow-weighted average water supply based on Consumer Confidence Reports for 2004 through 2006 for California Water Service Company and Dixon-Solano Municipal Water Service (part of Solano Irrigation District).

A city's wastewater can contain excessive salt due to commercial or industrial uses, as well as the residential use of water softeners. Citizens often install water softeners to offset the impacts of hard water. A study prepared by the County Sanitation Districts of Los Angeles County<sup>3</sup> regarding sources of chloride found a 32 mg/L to 72 mg/L increase in effluent chloride concentration over supply in neighborhoods with 6% to 15% of households using self-regenerating water softeners, and a 367 mg/L to 435 mg/L effluent chloride increase over supply in neighborhoods with 51% to 61% of homes using self-regenerating water softeners. Self-regenerating water softeners use a resin to exchange calcium and magnesium (hardness) in the water for sodium. When the resin becomes saturated, it is automatically regenerated by the addition of large quantities of sodium chloride solution. The sodium displaces the calcium and magnesium, which are then flushed, along with the chloride from the sodium chloride solution, to the sewer system.

Because of the City's hard water supply, many residences and businesses in Dixon use self-regenerating water softeners. The discharge of brine from the water softeners to the community sewer appears to account for most of the excess salinity measured in the wastewater effluent. The City's 13 March 2008 (corrected 15 April 2008) comments to the tentative CDO state that almost 500,000 pounds of salt is sold annually in Dixon, and that the majority is probably used in residential self-regenerating water softeners. The City's modeling data shows that effluent from homes using self-regenerating water softeners will contain up to 400 mg/L of sodium and 730 mg/L calcium. The effluent from homes with non-salt conditioning systems will contain only 120 mg/L of sodium and 95 mg/L of calcium.

As described in Regional Water Board staff's analysis of the groundwater conditions at the Dixon wastewater treatment plant (Attachment B and the Findings of the proposed CDO), the discharge of saline wastewater has degraded or polluted groundwater beneath the facility. It is reasonable to require the City to take measures to control the sources of salinity which enter its waste stream.

Since at least 2004, the City has repeatedly stated its intent to regulate the use of salt-discharging water softeners within its service area. However, the City does not currently regulate the use of water softeners. In addition, the City's existing sewer use ordinances do not specifically address salt discharges from either existing or future industrial users. The City's 13 March 2008 document states that the City intends to control sources of salinity by (a) modifying its local limits ordinance to limit or eliminate the discharge of water softener brine from commercial and industrial sources into the sewer system, (b) as allowed by law, adopting residential water softener control measures, and (c) implementing a public education program. The proposed CDO provides timelines for these proposals, and requires a later evaluation of their effectiveness in reducing the salinity of the City's wastewater.

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3 Santa Clarita Valley Joint Sewerage System Chloride Source Report, 2002

## **Requirements of the Proposed Cease and Desist Order**

This section of the staff report summarizes the specific requirements found in the “Hereby Ordered” section of the proposed Order.

### Flow

The City of Dixon’s General Plan authorizes a growth rate of up to 3% per year, with the unused growth allowance from one year being carried forward to subsequent years. Development in the WWTF service area has been slowed by the rejection of a major commercial development project and the current housing market decline. The current capacity of the WWTF is 1.82 mgd, and it appears that the WWTF has sufficient capacity for three to four years at the maximum allowable residential growth rate of three percent, assuming that there is no significant commercial or industrial growth. Should housing market conditions improve, flows to the WWTF may approach its design capacity before 2014.

The tentative CDO, at Task 1, carries forward the average dry weather influent flow limitation of 1.82 mgd and a total influent flow limitation of 880 million gallons per year from CDO No. R5-2005-0078. If a Report of Waste Discharge is submitted, Task 9 of the tentative CDO requires inclusion of information on any WWTF expansion necessary.

### Effluent Limitations

The proposed CDO includes interim performance-based effluent limitations for sodium and chloride based on effluent monitoring data collected from April 2004 through June 2008, a final effluent sodium limitation based on background groundwater quality, and a final effluent limitation for chloride based on protection of groundwater beneficial uses. The interim performance-based limitations would take effect upon adoption of the CDO, while the final limitations would go into effect 1 January 2014. The interim performance-based effluent limitations are designed to immediately protect the groundwater from further impacts while the City implements its source reduction and/or physical improvements, while the final effluent limitations are included to ensure compliance with the Groundwater Limitations contained in the WDRs, which are shown below.

The Groundwater Limitations of Order No. 94-187 state:

*“The discharge shall not cause underlying groundwater to:*

- 1. Contain waste constituents in concentrations statistically greater than receiving water limits, where specified below, or background groundwater quality where not specified.*
- 2. Contain chemicals, heavy metals, or trace elements in concentrations that adversely affect beneficial uses or exceed maximum contaminant levels specified in 22 CCR, Division 4, Chapter 15.*
- 3. Exceed a most probable number of total coliform organisms of 2.2/100 mL over any seven-day period.*

4. *Exceed concentrations of radionuclides specified in 22 CCR, Division 4, Chapter 15.*
5. *Contain taste or odor-producing substances in concentrations that cause nuisance or adversely affect beneficial uses.*
6. *Contain concentrations of chemical constituents in amounts that adversely affect agricultural use.”*

Finding 8 of the WDRs states that “[t]he beneficial uses of underlying ground water are domestic, industrial, and agricultural supply.” Ground Water Limitation D.6 requires the Dixon discharge not to cause the underlying groundwater to contain chemical constituents in concentrations in excess of levels that adversely affect agricultural use. Those chemical constituents most relevant to the Dixon WWTF are sodium and chloride because the excess salinity in Dixon sewage is largely attributable to the use of water softeners in the community. The *Solano County Crop and Livestock Report for 2007* reports agricultural production of a wide range of crops, including such salt-sensitive crops as almonds, beans, cabbage, carrots, corn, peppers, plums, and onions. While many farms in the Dixon area are served by Solano Irrigation District, farms in the immediate vicinity of the WWTF also rely on groundwater for agricultural irrigation supply. The document *Water Quality for Agriculture*<sup>4</sup>, recommends that the chloride and sodium concentrations in waters used for agricultural irrigation not exceed 106 mg/L and 69 mg/L, respectively.

The Basin Plan (Implementation, IV-15.00) states, in its Controllable Factors Policy, that “[c]ontrollable water quality factors are not allowed to cause further degradation of water quality in instances where other factors have already resulted in water quality objectives being exceeded. Controllable water quality factors are those actions, conditions, or circumstances resulting from human activities that may influence the quality of the waters of the State, that are subject to the authority of the State Water Board or Regional Water Board, and that may be reasonably controlled.”

The Basin Plan (Implementation, IV-17.00) states, in its Policy for Application of Water Quality Objectives, that “[i]n cases where the natural background concentration of a particular constituent exceeds an applicable water quality objective, the natural background concentration will be considered to comply with the objective.”

As described in Attachment B, the background groundwater sodium concentration is 143 mg/L, using statistics approved by Regional Water Board and State Water Board staff. To comply with the Implementation section of the Basin Plan, the final effluent limitation for sodium has been set at the background concentration. Compliance monitoring will be conducted in the treatment ponds, percolation/evaporation ponds, and land application disposal areas to determine the actual quality of the percolating discharge.

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<sup>4</sup> Food and Agriculture Organization of the United Nations—Irrigation and Drainage Paper No. 29, Rev. 1 (R.S. Ayers and D.W. Westcot, Rome, 1985)

Because the Discharger is in violation of the Groundwater Limitations of the WDRs and cannot reasonably be expected to comply with those limitations for several years, it is appropriate to set interim performance-based effluent limits to minimize groundwater pollution to the extent possible. These interim limits are set at the maximum observed effluent concentrations for sodium and calcium. Compliance monitoring for these interim limitations will continue to be conducted at a point downstream of the treatment ponds and before discharge to the percolation/evaporation ponds or land application disposal areas.

A table summarizing sodium and chloride data and the proposed final effluent limitations is shown below:

Parameter	Effluent			Background Groundwater	Recommended to Protect Agriculture	Interim Limit	Final Limit
	Min.	Max.	Mean	--	Seasonal Average	Monthly Average	Monthly Average
Sodium, mg/L	110	330	181	<b>143</b>	69	330	143
Chloride, mg/L	85	340	172	50	<b>106</b>	340	106

#### Salinity Source Control

Because the Discharger is in violation of the groundwater limitations and cannot reasonably be expected to comply with those limitations for several years, it is appropriate to require that the Discharger implement best practicable treatment and control measures to reduce pollutant concentrations in the wastewater on the schedule in the proposed CDO. Task 4 of the proposed CDO requires the City to complete and submit a *Salinity Source Study* as described in Health and Safety Code Section 116786 by 30 September 2008. Task 8 of the proposed CDO requires the City to submit a *Salinity Source Control Effectiveness Report* by 31 January 2012 describing the results of its source control program and setting forth conclusions about whether physical improvements to the WWTF are necessary.

The City estimates that salt-discharging water softeners contribute to between 40% and 50% of the salinity load to the WWTF. Control of residential salinity inputs will contribute to the achievement of water quality objectives. Task 6 of the proposed CDO requires the City to submit a *Residential Salinity Source Control Plan* that describes measures the City will undertake to address salinity discharged into the community sewer system from existing residential water softening or conditioning appliances.

In an effort to control salt discharges, the City has proposed to adopt sewer use ordinances prohibiting the installation of residential water softening or conditioning appliances that discharge salinity to the community sewer system and establishing local limits for sodium and chloride for industrial users of the community sewer system. Tasks 5 and 7 of the proposed CDO require submittal of the adopted ordinances.

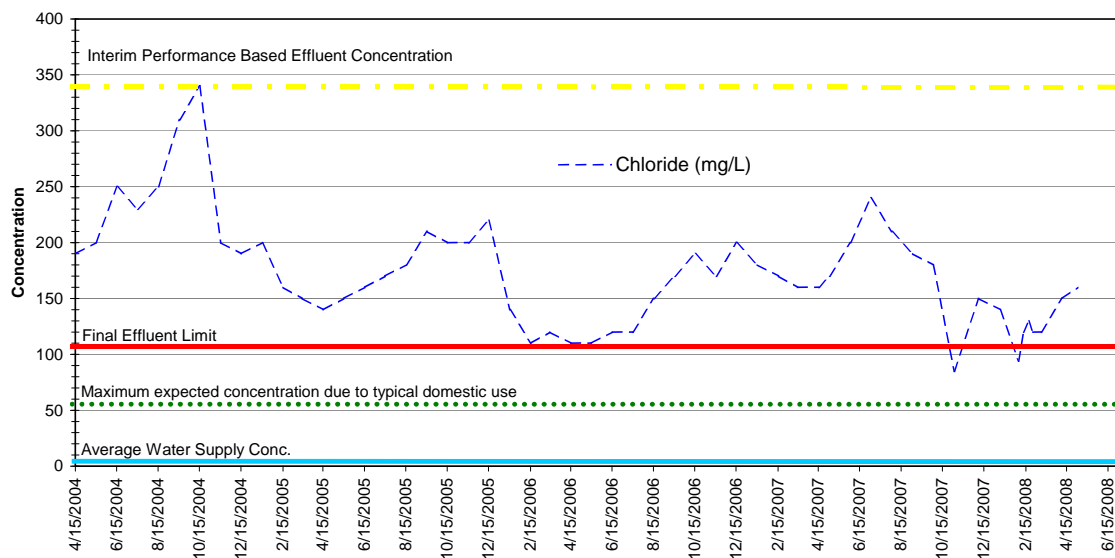
#### Other Required Reports

While the proposed CDO does not require additional groundwater monitoring or other investigations unrelated to sources of salinity, it is Regional Water Board staff's understanding

that the City of Dixon intends to conduct some such monitoring and/or investigations on its own. To ensure coordination and efficient use of resources, Task 3 of the proposed CDO requires that the City submit a workplan to Regional Water Board staff for review prior to commencement of any water quality study or investigation intended to support a report of waste discharge and/or revised effluent or groundwater limitation. If the City completes additional hydrogeologic work, it may ask that the Regional Water Board reconsider the final effluent limits contained in the CDO.

Given the high costs associated with treatment for salts, it is the sincere hope of both the City and Regional Water Board staff that compliance may be achieved through source control. If, however, the City and/or Regional Water Board staff conclude that physical improvements to the WWTF are necessary, then Task 9 of the proposed CDO requires the City to submit a Report of Waste Discharge by 31 January 2013. The Report of Waste Discharge would include a detailed description of all improvements and new facilities required to comply with this Order, to control/prevent groundwater degradation, and, if necessary, to expand the WWTF.

Figures 1 and 2 (below) show the concentrations of sodium and chloride in the City's effluent since April 2004. These values are contrasted with the performance-based effluent limit and final effluent limit contained in the proposed CDO. In addition, the figure shows the sodium and chloride concentration of the City's water supply, and the expected increase in sodium and chloride concentrations in the wastewater from normal domestic use. As can be seen from the figures, if the City removes the excess sources of salinity (residential water softeners, industrial sources, and commercial sources) from its waste stream, then it is likely that it will meet its final effluent limitations without having to make physical improvements to the wastewater treatment plant.



*Figure 1—Chloride Concentrations*



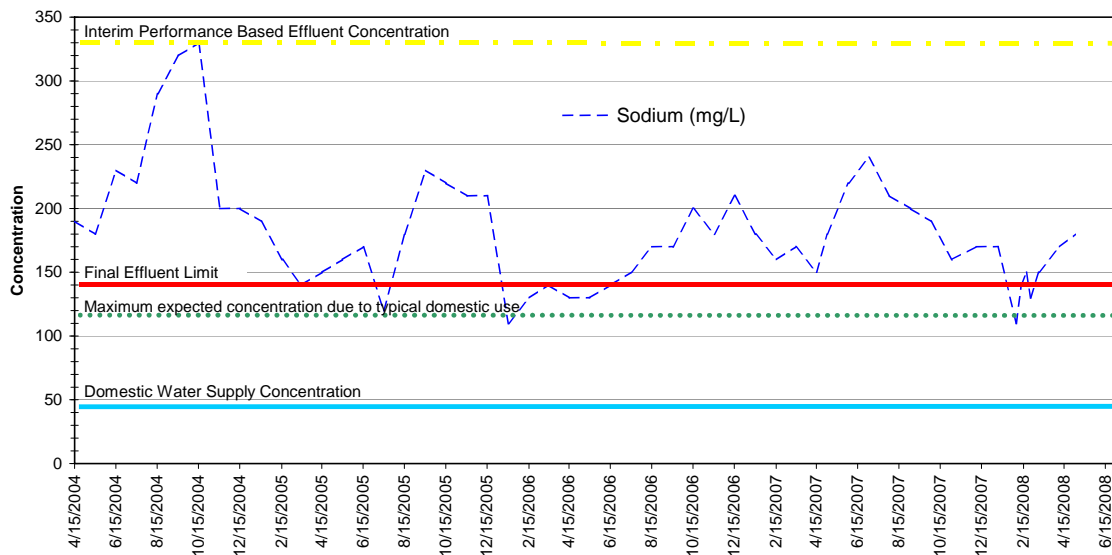


Figure 2—Sodium Concentrations

## Compliance Options

Compliance with the proposed CDO will likely require multiple-pronged approach. Some of the options available to the City, which the City may have already investigated, include the following:

- A change in the domestic water supply to a water with lower hardness would reduce the desire for residential water softeners, resulting in decreased salt loads to the WWTF.
- Well-head treatment of the City's water supply for hardness would allow consolidation and better control of salinity impacts. Saline discharges could be disposed of at a treatment plant with a permitted ocean discharge.
- Public education and source control. Adoption of sewer use ordinances restricting salt discharges from commercial and industrial users and preventing the installation of additional residential self-regenerating water softeners could aid in reducing salt loads to the WWTF. If future legislation permits, removal of existing water softeners could result in substantial reductions in sodium and chloride loads.
- Relocation of sewage treatment, percolation, and disposal areas to a site with poorer quality groundwater would result in less restrictive groundwater and effluent limitations.
- Facility modifications could be made to reduce evapo-concentration and/or to remove salts, resulting in compliant sodium and chloride concentrations.
- Full containment of the sewage treatment and disposal process would result in no discharge to groundwater, thereby complying with groundwater limitations.

## **Summary and Recommendation**

In summary, the City has not complied with CDO No. R5-2005-0078, and has taken no action beyond preliminary planning efforts to comply with the pollution prevention/control requirements of that Order. The City has degraded underlying groundwater with sodium, polluted underlying groundwater with chloride, and had more than ten years of notice of the Regional Water Board's concern regarding the City's impacts to groundwater. In addition, due in large part to the residential use of salt-discharging, self-regenerating water softeners, the salinity concentrations in the City's discharge are in excess of that of a typical water supply plus an incremental increase due to normal domestic usage.

The proposed CDO would protect groundwater quality and enforce compliance with groundwater limitations contained in WDRs Order No. 94-187 by:

- Requiring immediate compliance with performance-based interim effluent limitations for sodium and chloride;
- Requiring the City of Dixon to implement source control measures;
- Requiring the City of Dixon to make facility improvements if the source control measures are not sufficient to remove salt from the wastewater; and
- Requiring compliance with water quality-based effluent limitations by January 2014.

Staff recommends that the Regional Water Board adopt the Cease and Desist Order.

Attachment A: Responses to Public Comments  
Attachment B: Summary of Groundwater Conditions  
Attachment C: City of Dixon Comment Letter  
Attachment D: Michael Ceremello Comment Letter